CORTICIUMS CAUSING PELLICULARIA DISEASE OF THE COFFEE PLANT, HYPOCHNOSE OF POMACEOUS FRUITS, AND RHIZOCTONIA DISEASE[1]

EDWARD ANGUS BURT

Mycologist and Librarian to the Missouri Botanical Garden
Associate Professor in the Henry Shaw School of Botany of Washington University

Last year Professor F. L. Stevens sent to the author specimens of coffee branches collected at Mayaguez, Porto Rico, August, 1915, which were infested with the Pellicularia fungus, and requested that study be made to determine whether this fungus is not one of the *Thelephoraceae*. In compliance with this request, preparations were made from the material, which finally afforded simple basidia bearing hyaline, even spores 12×4 μ, flattened on one side. This fungus is a *Corticium* with habit of growth and structure greatly resembling the *Hypochnus ochroleucus* Noack which Dr. Stevens studied in 1907.

Upon looking up the literature of the Pellicularia fungus complications developed as follows:

1. *Pellicularia koleroga* was published by M. C. Cooke, in 1876, as a hyphomycete having solitary, globose, echinulate spores situated here and there along the sides of the hyphae. In the article in Popular Science Review **15**: 164–165. 1876, Cooke expresses doubt as to whether the globose bodies are spores, because they do not become detached from the hyphae, and believes that their true nature will have to be decided by germination experiments. The material upon which Cooke based his species was collected at Mysore, India.

2. Dr. A. Ernst studied diseases of coffee in Venezuela and published a paper in 1878, entitled "Estudios sobre las Deformaciones, Enfermedades y Enemigos del Arbol de Cafe in Venezuela," pp. 1–24. Caracas. One of the diseases consid-

[1] Issued May 24, 1918.

ered in the paper is named by Ernst as Candelillo, and its fungous cause is described rather fully by him as *Erysiphe scandens,* with an illustration of mycelium bearing conidia. Specimens of coffee leaves affected with "Candelillo" were sent to Kew Herbarium by Ernst; these specimens were studied by Cooke, who determined the fungus as his *Pellicularia koleroga.*

3. In 1912, Kuijper concluded that the fungous leaf blight of coffee in Porto Rico is distinct from that causing Candelillo in Venezuela and different from *Pellicularia koleroga* of India. Shortly afterward G. L. Fawcett obtained through E. J. Butler specimens of the coffee blight fungus from Mysore, the type locality, and concluded that the Porto Rican fungus agreed in every way with that from Mysore, but that the Venezuelan fungus is distinct. Neither of these authors noted the basidiomycetous nature of the fungus which they studied, although it is obvious from the illustration by Fawcett that he figured young basidia as hold-fast cells.

Upon writing to the Kew Herbarium for a fragment of the type of *Pellicularia koleroga* Cooke, in order that I might determine for the systematic account of North American species of *Corticium* the status of the *Corticium* parasitic upon coffee leaves at Mayaguez, the Director of Kew Herbarium kindly presented me with small portions of the Venezuelan specimens which had been received from Ernst and regretted that the Mysore specimen was now so fragmentary that only microscopical preparations from it could be spared. Miss Wakefield very kindly sent with these preparations drawings which she made of the basidia, spores, and hyphae from the above-mentioned preparation as soon as prepared, drawings of the same parts in the Ernst Candelillo specimen, similar drawings and portion of a specimen on coffee collected in Colombia by H. T. Dawe, and other drawings of the same organs based on Trinidad specimens collected by J. H. Hart.

The collections on coffee leaves made by Dr. Stevens and Mr. H. E. Thomas, at Mayaguez, Porto Rico, in August, 1915,

and in May, 1917, respectively, agree with the collections from Venezuela and Colombia in all respects except slight differences as to whether the hyphae are hyaline or slightly colored. In cross-sections of the leaves of all the specimens, fungous hyphae are present more or less abundantly between the cells of the leaf parenchyma and extending across the intercellular spaces of the leaf. Occasionally these hyphae may be traced outward to the under surface of the leaf, where they form a part of the layer, one to three hyphae thick, of hyphae running along the surface of the leaf, sending out branches at nearly a right angle, and forming a membrane about as loosely interwoven as the fructification of the common *Corticium vagum*. These hyphae range from $4\frac{1}{2}$ to 6 μ in diameter and are neither nodose-septate nor incrusted. In the Porto Rican specimens, which have most of their basidia still swollen with protoplasm and only occasionally bearing spores, and are therefore hardly mature, the hyphae are mostly hyaline and show no tinge of color except in the case of those hyphae next to the substratum, where local thickenings of the fructification occur. In the Ernst collection from Venezuela the hyphae when stripped from the leaf are of a very dilute honey-yellow—the honey-yellow of Ridgway greatly diluted. The hyphae of the specimen from Colombia are sometimes hyaline and sometimes with a slight yellowish tint, being about intermediate between the Ernst collections and those from Porto Rico.

Basidia are scattered along the hyphae at right angles to the surface of the leaf. But few basidia are present in the Ernst specimen, which appears to me to be old, and I did not succeed in finding spores in the few preparations which the bit of material permitted. Miss Wakefield found the spores of this collection to be $9–13\times3\frac{1}{2}–4$ μ. The basidia collapse quickly after spore formation.

Nothing in the nature of appressoria for attachment of the fructification to the leaf could be found; the fructification appears to be anchored along the under side of the leaf by the hyphae from the parasitic intercellular vegetative mycelium,

which pass out to the under side of the leaf and there branch, become interwoven and form the membranous fructification.

The spores are very uniform in size and form, hyaline, even, slightly curved, 9–13×3½–4 μ for all American collections, and were published by von Höhnel as 10–12×4–4⅕ μ for the Mysore type, and noted by Miss Wakefield as 10–13×4–5 μ for the latter.

Von Höhnel described Cooke's type of *Pellicularia koleroga* from Mysore as having "Grundhyphen gerade verlaufend, dünnwandig, meist blaszbräunlich, 6 bis 7 μ breit, langgliedrig; . . . . Zweige zartwandig, hyalin, mit aufeinander fast senkrecht stehenden Abzweigungen versehen." Miss Wakefield has noted as hyaline the hyphae of this specimen which she has drawn.

In the comment following the specific description of *Pellicularia koleroga,* Cooke stated, "threads creeping, branched, septate, interwoven into a subgelatinous pellicle which can be stripped from the leaf when moist." The introduction of the word *subgelatinous* was unfortunate and misleading, for it gave the idea of a fructification of the consistency of a tremellaceous fungus or of a gelatinous lichen. If we turn to Popular Science Review **15** : 164, we see that Cooke was led to assume the presence of a gelatinous medium to account for the fact that organs which he regarded and figured as spores—which we now conclude were the basidia—did not float loose in any case from the hyphae upon which they were borne. In all fungi of gelatinous or tremellaceous consistency which the present writer has studied, the gelatinous substance is due to a gelatinous modification of the outer portion of the cell wall of the hyphae concerned, so that only the lumen of the hypha remained sharply defined when observed with the microscope; the cell walls of the hyphae of the type of *Pellicularia koleroga* in the preparations received from Miss Wakefield are not in the least degree gelatinously modified. However, when, in case of other collections, I moisten the fructification on the leaf and detach it from the surface of the leaf with the point of a scalpel, I do detect in

places from along the very surface of the leaf a very delicate transparent membranous structure suggestive of the hypothallus of such a myxomycete as *Stemonitis* but much more tenuous and delicate. It is quite possible that this pellicle is a portion of the surface of the leaf, for it does not show in all preparations. Fawcett, who had the good fortune to be able to compare with Porto Rican material freshly collected specimens of *Pellicularia koleroga* collected by E. J. Butler at the type locality, Mysore, India, stated that the conclusion by Kuijper that the Porto Rican fungus is not *Pellicularia koleroga,* would seem reasonable if the possession of a gelatinous matrix were necessary to make it that fungus, but that the Mysore specimens agreed in every way with those growing in Porto Rico. In his independent redescription, as a *Corticium,* of Cooke's type of *Pellicularia koleroga,* von Höhnel does not employ the word *subgelatinous,* which everything seems to show should never have been used in connection with the fungus under consideration.

This study of the Pellicularia fungus on coffee plants in the tropics of America leads to the conclusion that this fungus is a *Corticium* not specifically distinct from *Corticium koleroga* (Cooke) v. Höhn., and that the description should be broadened slightly to comprehend better the specimens now known from widely separated regions, as follows:

Corticium koleroga (Cooke) v. Höhn. K. Akad. Wiss. Wien Sitzungsber. **119**: 395. 1910.

Pellicularia koleroga Cooke, Grevillea **4**: 116, 134. 1876; Pop. Sci. Rev. **15**: 164. *pl. 135. f. a–c.* 1876; Linn. Soc. Bot. Jour. **18**: 461. 1881; Sacc. Syll. Fung. **4**: 149. 1886; Fawcett, G. L., Porto Rico Agr. Exp. Sta. Ann. Rept. **1910**: 35. 1911; Jour. Agr. Res. **2**: 231. *text f. 1–3.* 1914; Porto Rico Agr. Exp. Sta. Bul. 17: 8. *pl. 1.* 1915.—*Erysiphe scandens* Ernst, A., Estudios sobre las Deformaciones, Enfermedades y Enemigos del Arbol de Cafe in Venezuela, 16. *pl. f. 5.* 1878.

Type: in Kew Herb.

The parasitic vegetative mycelium forms long, slender, mycelial strands of rather uniform diameter, whitish or pallid

at first, finally fuscous, running along the branches and midrib and veins of the leaves, infecting the leaves and ramifying between the cells of the leaf parenchyma, finally emerging at many points on the under side of the leaf to form minute fructifications which give a mottled appearance to the leaf; fructifications soon laterally confluent into a thin, arachnoid, perforate membrane covering the under surface of the leaf between midrib and principal veins, drying pale

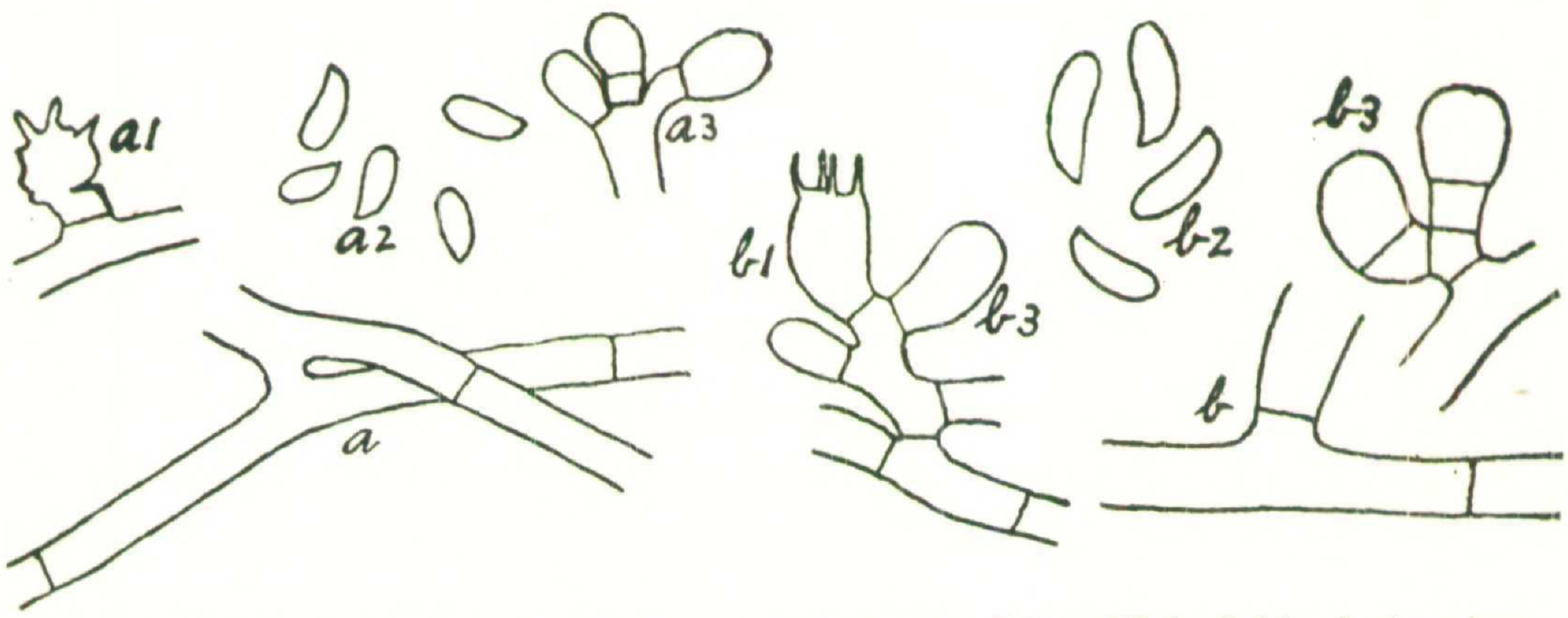

Fig. 1. C. koleroga. *a–a3*, from sketches by Miss Wakefield of structure of type in Kew Herbarium; magnification not stated but computed from spore dimensions at about 630. *a*, hypha; *a1*, collapsed basidium; *a2*, spores; *a3*, young basidia. *b–b3*, from Porto Rican specimen, ×870. *b*, hypha; *b1*, basidium; *b2*, spores; *b3*, young basidia.

smoke-gray, separable in small pieces, composed of loosely interwoven, hyaline or slightly colored, thin-walled, even, rigid hyphae 4½–6 μ in diameter, not nodose-septate, running parallel with the substratum, and about 1–3 hyphae thick, branching at right angles; basidia scattered along the hyphae, simple, ovoid, 10–12×7–8 μ, with short sterigmata; spores hyaline, even, flattened or slightly concave on one side, 10–13×3½–5 μ.

Mycelial strands in the specimens received are 35 cm. long and broken with the branch at the lower end, ½–1 mm. in diameter, not swollen into sclerotia; fructifications 9 cm. long, 4 cm. broad, 30–45 μ thick, more or less divided by the midrib and principal veins.

Parasitic on branches and leaves of the coffee plant. India, and the Antilles and neighboring regions of South America.

Specimens examined:

India: Mysore, preparation from the type (in Kew Herb.).

Porto Rico: Mayaguez, *F. L. Stevens, 9488* (in Stevens Herb. and in Mo. Bot. Gard. Herb., 54510); *H. E. Thomas* (in Mo. Bot. Gard. Herb., 55397).

Colombia: *H. T. Dawe,* fragment (in Mo. Bot. Gard. Herb. from specimen in Kew Herb.).

Venezuela: *A. Ernst,* fragments showing mottled stage and continuous fructification respectively (in Mo. Bot. Gard. Herb. from specimens in Kew Herb., determined by Ernst as Candelillo, *Erysiphe scandens*).

In 1907, Stevens published in Science, p. 724, under the name *Hypochnus ochroleucus* Noack, the preliminary account of a *Corticium* parasitic upon branches and leaves of the apple, pear, and quince, in the southern United States; the detailed, illustrated account of this fungus was published later in Annales Mycologici **7**: 49–59. 1909. This fungus is closely related in general aspect and morphological structure to *Corticium koleroga* but differs sufficiently in some details in the collections which have come under observation so that Miss Wakefield and Professor Stevens agree with me in regarding it as a distinct species. In transferring *Hypochnus ochroleucus* Noack to *Corticium,* it becomes necessary to give the species a new specific name, because there is already a valid *Corticium ochroleucum* Bres. In order to bring this species in sharper contrast with the preceding, I redescribe *H. ochroleucus* and name it as follows:

Corticium Stevensii Burt, n. nom.

Hypochnopsis ochroleuca Noack, Boletim do Instituto Agronomico Sao Paulo em Campinas **9**: 80. 1898.—*Hypochnus ochroleucus* Noack in Sacc. Syll. Fung. **16**: 197. 1902; Stevens, Science N. S. **26**: 724. 1907; Stevens & Hall, Ann. Myc. **7**: 49–59. *text f. 1–8.* 1909.—Not *Corticium ochroleucum* Bresadola, Fungi Tridentini **2**: 58. *pl. 167. f. 2.* 1892.

Vegetative mycelium forms on the twigs roundish or oblong, chestnut-brown sclerotia 3–4 mm. in diameter, and also

slender mycelial strands white when young, becoming chestnut-brown, running along the twigs and petioles to the leaves and fructifying there; fructifications at first downy and barely visible, soon thickening into a dirty pinkish buff, felty membrane covering the whole under side of the leaf and frequently separable from it as a whole by mere handling; hyphae hyaline or slightly colored, giving their color to the fructifications, even, thin-walled, not incrusted, not nodose-septate, $4\frac{1}{2}$–$7\frac{1}{2}$ μ in diameter; basidia scattered along the hyphae on short lateral branches, simple, 11×7–8 μ, with four short sterigmata; spores hyaline, flattened or slightly concave on one side, 8–11×3–4 μ.

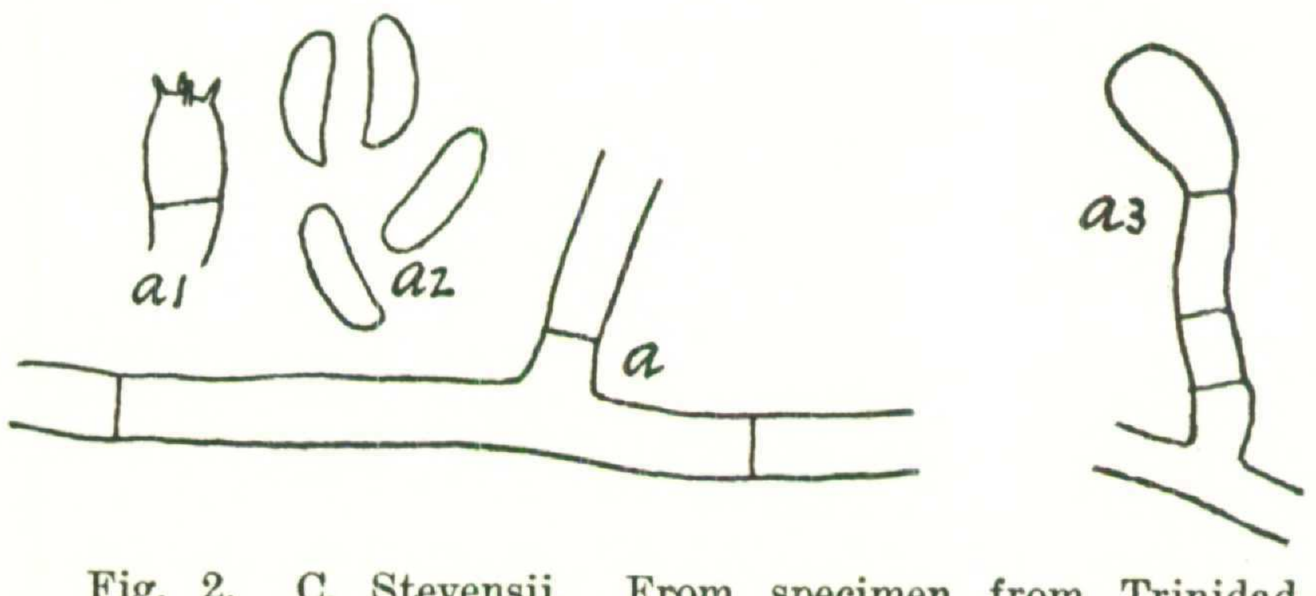

Fig. 2. C. Stevensii. From specimen from Trinidad, ×870. *a*, hypha; *a1*, basidium; *a2*, spores; *a3*, young basidium.

Fructification 11 cm. long, 3–4 cm. broad, 45–60 μ thick, unbroken over whole under surface of leaves; sclerotia 3–4 mm. in diameter; mycelial strands $\frac{1}{2}$–1 mm. in diameter, many cm. long.

On apple, pear, and quince, in Brazil and southern United States, causing the leaves to dry and fall, and on *Codiaeum* in Trinidad.

This species differs from *Corticium koleroga* by having sclerotia and thicker, darker-colored, and more felted fructifications which are but feebly attached to the leaf and form an unbroken covering over the whole under surface of the leaf from margin to margin. Fruiting specimens of this fungus have been available for study from only two localities, but these specimens agree in the characters stated above.

None of the vertical sections of leaves bearing fructifications of *C. Stevensii* have yet shown vegetative hyphae in the intercellular spaces of the leaves, although I have made several sets of preparations expressly for the demonstration of such hyphae. A set of preparations from the petiole of a pear leaf well-coated with the fungus did not show hyphae in the interior of the petiole. Microscopic characters of *C. Stevensii* and *C. koleroga* are within the limits of fluctuation of a single species. In connection with the collections on *Codiaeum* Dr. Rorer wrote, "This thread blight occurs here in the damp valleys every year and takes quite a toll of crotons, nutmegs, and many decorative plants, even roses."

Specimens examined:

North Carolina: Horseshoe, *J. G. Hall,* comm. by F. L. Stevens, sclerotial stage on pear twigs; Mt. Airy, *F. C. Reimer,* comm. by F. L. Stevens, fertile stage on pear leaves.

Georgia: *A. L. Quaintance,* comm. by F. S. Earle, sclerotial stage on apple twigs.

Florida: *C. G. Lloyd,* sclerotial stage on pear twigs.

Texas: Dickson, *F. W. Mally,* comm. by U. S. Dept. of Agr., sclerotial stage on pear twigs.

Trinidad: Diego Martei, *J. B. Rorer,* fertile stage on leaves of *Codiaeum variegatum* (in Mo. Bot. Gard. Herb., 44771); Petit Valley, *J. B. Rorer,* sclerotial and fruiting stages on leafy twigs of *Codiaeum variegatum* (in Mo. Bot. Gard. Herb., 11960, 19786, 19810, and 20062).

Corticium vagum Berk. & Curtis is another parasitic *Corticium,* which belongs in the section with the preceding species by reason of the structure of its fructification. In contrast with the mycelium and sclerotia upon stems of the portions of the host above ground in the preceding species, *C. vagum* has its mycelium saprophytic in the soil and becoming parasitic and sometimes forming sclerotia on subterranean portions of host plants, such as roots or underground stems,—presumably an adaptation to the climatic con-

ditions of the region in which this species lives. The parasitic mycelial stage of *C. vagum* is *Rhizoctonia Solani* Kühn, for full accounts of which and for the literature, reference may be made to the papers by Duggar in Ann. Mo. Bot. Gard. **2**: 424–458. 1915, and Peltier, Univ. of Ill. Agr. Exp. Sta. Bul. 189: 283–390. 1916. *Corticium vagum* is known to the writer by fruiting specimens ranging in North America from New Brunswick to southern United States and from the Atlantic to the Pacific, and in Europe by specimens from Sweden and Russian Poland. *Rhizoctonia Solani* has been reported from regions, additional to the above, of the West Indies, India, and Australia. *Corticium vagum* is remarkable, not only by the ability of its vegetative mycelium to live as a saprophyte in soil and wood and as a parasite in living plant tissues, but it may come to the surface and fruit on each of these substrata—very commonly indeed on old wood and bark lying on the ground, more rarely on the small stems of potatoes, tomatoes, rhubarb, radishes, beans, *Amaranthus, Plantago,* etc., just above the surface of the ground. I have received only one specimen in which the fructifications were directly on the surface of the ground itself, but the fructification is so inconspicuous when on the ground that it may be easily overlooked. The wide range as to substratum of *C. vagum* has led to its having been described in Europe as *Hypochnus Solani* when collected on potato stems and as *Corticium botryosum* when on old wood. The synonymy and description follow:

Corticium vagum Berk. & Curtis, Grevillea **1**: 179. 1873; Sacc. Syll. Fung. **6**: 616. 1888; Massee, Linn. Soc. Bot. Jour. **27**: 148. 1890; Duggar, Mo. Bot. Gard. Ann. **2**: 445. 1915; Peltier, Univ. of Ill. Agr. Exp. Sta. Bul. 189: 285. 1915.

Corticium vagum Berk. & Curtis var. *Solani* Burt in Rolfs, Science N. S. **18**: 729. 1903; Colo. Agr. Exp. Sta. Bul. 91: 1–20. *pl. 1–5.* 1904.—*Hypochnus Solani* Prill. & Del. Soc. Myc. Fr. Bul. **7**: 220. *text f.* 1891; Sacc. Syll. Fung. **11**: 130. 1895.—*Corticium Solani* Prill. & Del. in Bourd. & Galz. Soc. Myc. Fr. Bul. **27**: 248. 1911. — *Corticium botryosum* Bresa-

dola, Ann. Myc. **1**: 99. 1903; Sacc. Syll. Fung. **17**: 173. 1905; Bourd. & Galz. Soc. Myc. Fr. Bul. **27**: 248. 1911.—*Rhizoctonia Solani* Kühn, Krankheiten d. Kulturgewächse, 224. 1858; Duggar, Mo. Bot. Gard. Ann. **2**: 424. 1915.

Type: in Kew Herb. and in Curtis Herb.

Vegetative mycelium saprophytic in the soil and in wood in contact with the ground, and parasitic as the *Rhizoctonia Solani* stage in underground portions of various plants and forming at their surface underground minute sclerotia; fructification a thin, arachnoid, perforate membrane more or

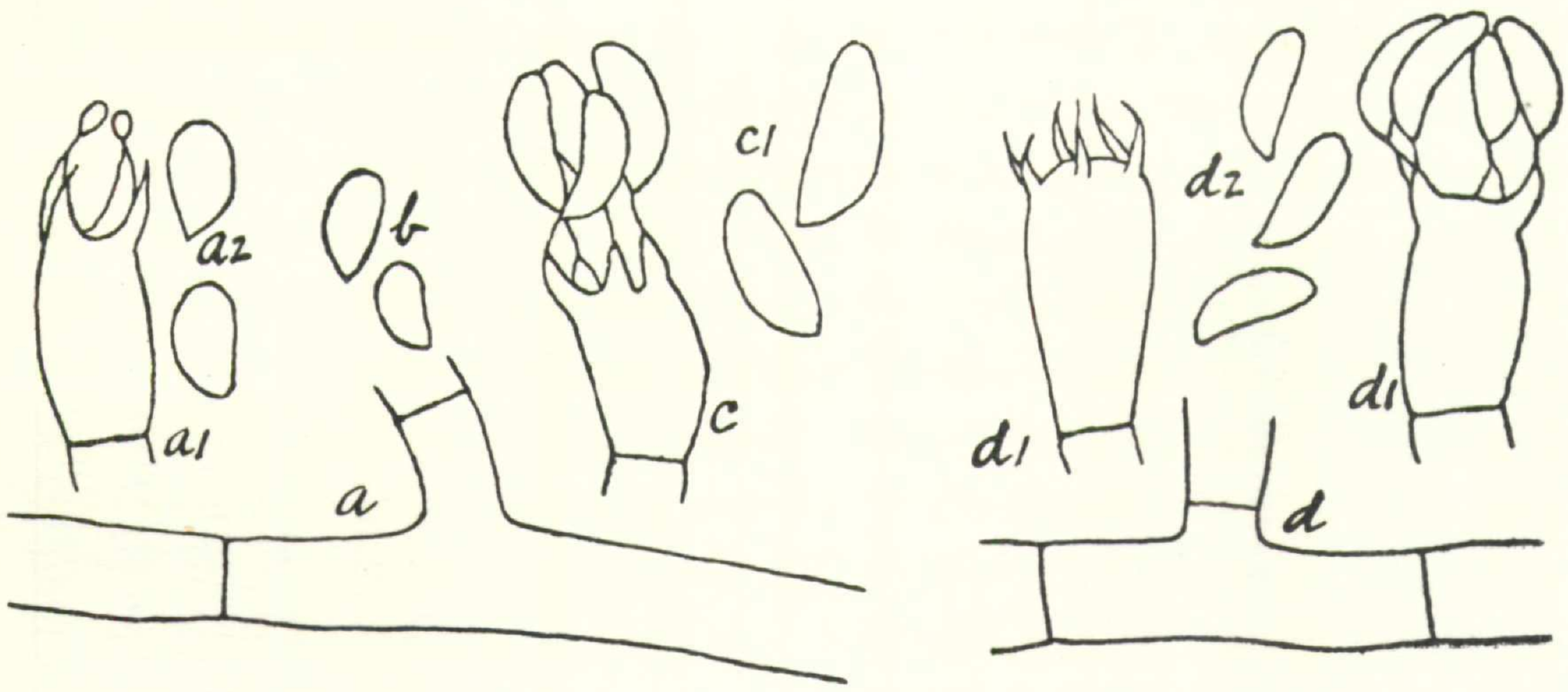

Fig. 3. C. vagum, ×870. *a–a2*, from specimen on potato in Colorado. *a*, hypha; *a1*, basidium; *a2*, spores. *b*, spores of specimen on *Plantago* in Illinois. *c–c1*, from specimen on earth in Massachusetts. *c*, basidium; *c1*, spores. *d–d2*, from specimen on wood in British Columbia. *d*, hypha; *d1*, basidia; *d2*, spores.

less separable, pale olive-buff to cream color; in structure 60–100 μ thick, composed of a few loosely interwoven hyphae running along the substratum and sending out short branches which bear the basidia; hyphae in contact with substratum may be slightly brownish, hyaline elsewhere, not incrusted, not nodose-septate, up to 6–10 μ in diameter, with branches smaller; basidia not forming a compact hymenium, 10–20× $7\frac{1}{2}$–11 μ, with 4–6 sterigmata 6–10 μ long and more or less swollen towards the basidium; spores hyaline, even, flattened on one side, 8–14×4–6 μ.

Fructifications 5–15 cm. long on logs, 5–10 cm. broad; in a collar 1–10 cm. long, sheathing the base of living stems.

On bare earth, wood and bark lying on the ground, and on living stems of potatoes, beans, rhubarb, horseradish, tomatoes, *Amaranthus,* etc., at or near the ground. New Brunswick to Florida and westward to Vancouver and Washington, in West Indies, Europe, India, and Australia. Common.

Corticium vagum differs from *C. koleroga* and *C. Stevensii* in having its mycelium and sclerotia subterranean when parasitic, in having its fructifications at the surface of the ground or merely sheathing small herbaceous stems for only a few centimeters up from the ground and never spreading out on the under side of broad leaves at a considerable distance above ground, by having larger hyphae, larger basidia, and the basidia with larger sterigmata which are more thickened in the lower portion and sometimes six to a basidium; the spores are somewhat larger in *C. vagum* also. The examination of the large amount of *C. vagum* which has come to hand does not afford ground for regarding the collar-like fructifications on small living herbaceous stems as worthy of varietal separation. As common as this species now is in the United States, it is rather surprising that a collection of it under some name has not been found in Herb. Schweinitz.

Specimens examined:

Exsiccati: Ellis, N. Am. Fungi, 330; Ravenel, Fungi Am., 132, 577—the latter under the name *Zygodesmus pannosus.*

Sweden: Stockholm, *L. Romell, 204.*

Russian Poland: *Eichler,* comm. by Bresadola, portion of type of *Corticium botryosum* Bres.

New Brunswick: Campobello, *W. G. Farlow, 3.*

Canada: *J. Macoun, 2, 84, 340.*

Ontario: Ottawa, *J. Macoun, 327.*

Massachusetts: Brookline, *G. R. Lyman, 180;* Magnolia, *W. G. Farlow.*

New York: Albany, *H. D. House & J. Rubinger* (in Mo. Bot. Gard. Herb., 8734); East Galway, *E. A. Burt,* two collections; Ithaca, *Van Hook,* comm. by G. F. Atkinson, 8092; Karner, *H. D. House, 14.162,* and three other collections (in N. Y. State Herb. and Mo. Bot. Gard. Herb., 44709,

54349, 55199, 55203); Tripoli, *S. H. Burnham, 13,* in part (in Mo. Bot. Gard. Herb., 54506).

New Jersey: Belleplain, *C. L. Shear, 1244;* Newfield, *J. B. Ellis,* in Ellis, N. Am. Fungi, 330.

Pennsylvania: Carbondale, *E. A. Burt;* Trexlertown, *W. Herbst, 95.*

Maryland: Takoma Park, *C. L. Shear, 1164, 1334.*

District of Columbia: Takoma Park, *C. L. Shear, 965, 1041* (the former in Mo. Bot. Gard. Herb. also).

South Carolina: Curtis Herb., 3240, type (in Kew Herb. and in Curtis Herb.); Aiken, *H. W. Ravenel,* in Ravenel, Fungi Am., 132, 577.

Alabama: Montgomery, *R. P. Burke, 170* (in Mo. Bot. Gard. Herb., 43162).

West Virginia: Paw Paw, *C. L. Shear, 1171.*

Ohio: Cincinnati, *C. G. Lloyd, 4508.*

Illinois: Urbana, *G. L. Peltier,* fourteen collections, on living stems of beans, carrot, tomato, radish, rhubarb, horseradish, potato, winter vetch, spinach, *Amaranthus, Campanula,* and *Plantago major* (in Mo. Bot. Gard. Herb., 6264, 8761–8765, 8816, 43836, 44677–44682).

Montana: Evaro, *J. R. Weir, 434* (in Mo. Bot. Gard. Herb., 17725).

Idaho: Priest River, *J. R. Weir, 140, 89* in part (Mo. Bot. Gard. Herb., 8197, 11349).

Colorado: Fort Worth, *F. M. Rolfs,* two collections, on living stems of potatoes.

British Columbia: Sidney, *J. Macoun, 4, 20, 83, 85, 87, 26, 154* (in Mo. Bot. Gard. Herb., 5764, 5735, 7068, 7024, 7833, 55347, 55350, respectively) and *39a, 151, 172* (in Macoun Herb.); Vancouver Island, *J. Macoun, V89, V90, V151, V154, V172* (in Mo. Bot. Gard. Herb., 22815, 22927, 20357, 20507, 20728, respectively).

Washington: Bingen, *W. N. Suksdorf, 846, 852, 863.*

The term "thread blight" has been frequently used in plant pathology with reference to tropical fungi which ascend stems by filamentous, mycelial strands and fructify on the leaves, as in the case of *Corticium koleroga.* Such aërial,

mycelial strands are an adaptation to tropical climate for dispersal, apparently common to many species of fungi of various genera and families. In addition to the specimens of *C. koleroga* and *C. Stevensii,* cited in the earlier pages of this paper, I have seen collections by Mr. J. A. Stevenson, 6498, 6748, 6748a, on *Casearia sylvestris* and *Hippocratea volubilia* from Rio Piedras and Bayamon, Porto Rico, which show soft, white, mycelial strands running along the stems of the host plant to the leaves and not yet fruiting. Dr. F. L. Stevens, 7469, on *Mayepea domingensis,* from Mayaguez Mesa, Porto Rico, has a specimen, with fructifications still too immature for determination, which has spread by an effused mycelium rather than narrow strands for distances of three to four feet along the stems and extends out to leaves along the way. On the living leaves of *Nephrolepsis,* in Porto Rico, Dr. Stevens has a very interesting collection, No. 4380, which has the configuration of a resupinate species of *Hydnum* but has not yet formed basidia and spores. Dr. J. B. Rorer has sent to me from Trinidad photographs of the mycelial strands of the horse-hair blight on the stems of cacao, which seem to be white, cylindric, and compact; he notes that their fructification is usually a polypore.

It is evident that many kinds of fungi in the tropics have the curious "thread blight" habit of growth. One so fortunately placed as to be able to collect such fungi where growing could make sure that the fructifications were mature and of value for taxonomic study by making a spore collection on a glass microscope slide from the fresh specimen.